THEME: THE WORD OF LIVING THINGS

TOPIC: CLASSIFICATION OF PLANTS

FLOWERING PLANTS.

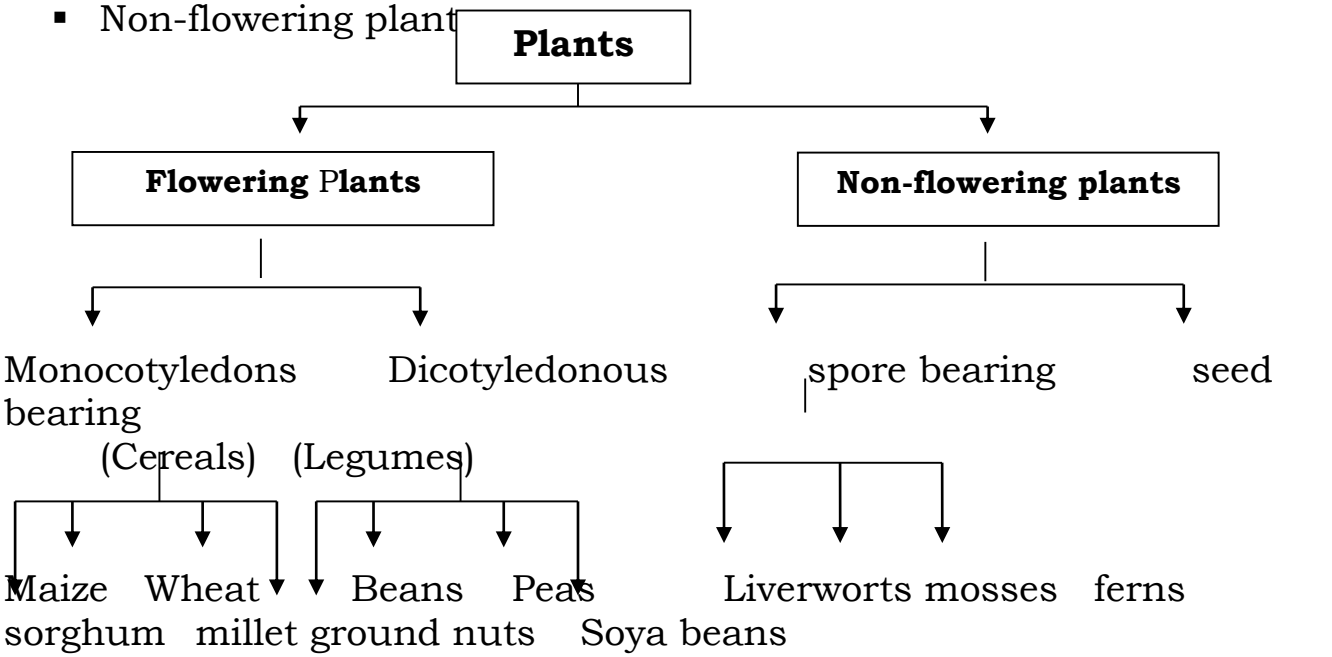
- Plants are living components of the environment
- Plants are the primary sources of food to animals

Classification of plants

- Classification of plants means grouping plants according to their different characteristics.

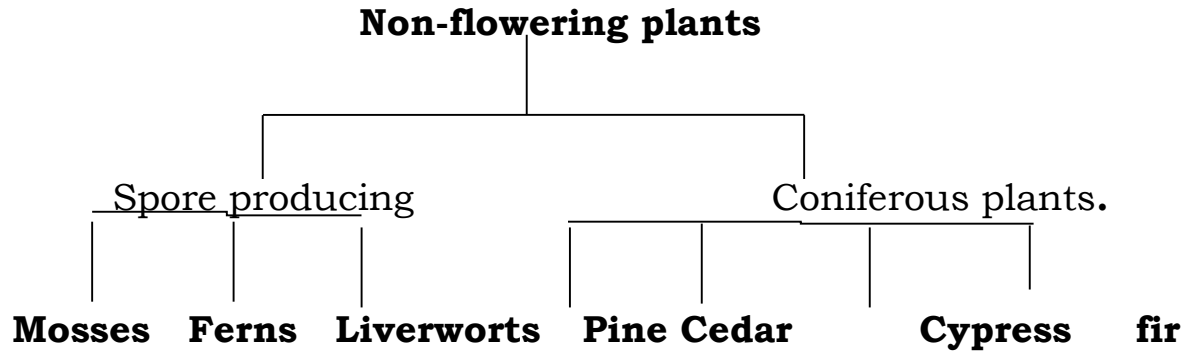
Plants are classified into two;

- Flowering plants
- Non-flowering plant



NON-FLOWERING PLANTS

- Non-flowering plants are groups of plants that do not bear flowers.
- Groups of Non-flowering plants
  - Spore producing.
  - Coniferous plants (seed bearing plants)**.**



Spore producing:

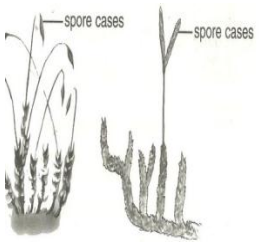
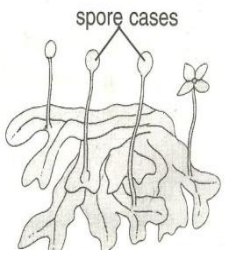
- Spore producing plants are groups of non-flowering plants that reproduce by means of spores.

- A spore is a single cell that can develop into a new plant under favorable conditions.

Examples of spore producing plants include; liverworts, mosses and ferns. Horse tails

- Ferns are the most advanced group of spore producing plants with proper leaves, stems and roots.
- Mosses are small green cushion-like and grow commonly on house roof verandas, tree trunks, and in damp soils.
- Liverworts have leaf like structures and commonly grow in wet moist places.

Illustrations showing different examples of spore producing plants.

Fern plant	Mosses plant	Liverwort plant
		

Note:

- All spore producing plants are green and therefore able to make their own food.

Conifers or Coniferous plants:

- Coniferous plants are non-flowering plants that reproduce by means of seeds produced in hard structures called cones.
- Conifers have roots, stems and small needle shaped leaves

Examples of coniferous plants include

- Pines
- Cedar tree
- Podo
- Cypress
- Fir

Importance of conifers

- Some are planted in compounds to provide shade and also act as wind breaks.
- Some conifers are planted around the compounds and farmers to act as live fences
- They are sources of soft wood timber

ALGAE

These are simple plants without true leaves and roots
They mostly grow in damp places
They reproduce by spore formation

EXAMPLES OF ALGAE

- Sea weed
- Ficus
- Spirogyra
- Euglena

VALUES OF ALGAE

- Algae add oxygen to water used by aquatic animals
- They are sources of food to aquatic animals
- They are used to make fertilizers

Learner's activity.

1. In one sentence show the meaning of non-flowering plants
2. Mention the two main groups of non-flowering plants
3. Conifers cannot bear flowers. How do they reproduce?
4. State two ways in which coniferous plants can be useful to people
5. Briefly explain why algae are not classified as plants.
6. How can algae be useful to an industrialist who deals in food processing?

FLOWERING PLANTS

- Flowering plants are plants that bear flowers and reproduce by means of seeds.

SYSTEMS OF FLOWERING PLANTS

- Shoot system
- Root system

Shoot system is the part that develops from the plumule. It grows above the ground.

PARTS OF THE SHOOT SYSTEM

- Leaves
- Flowers
- Axillary bud

- Stem
- Nodes
- Fruits
- Internodes

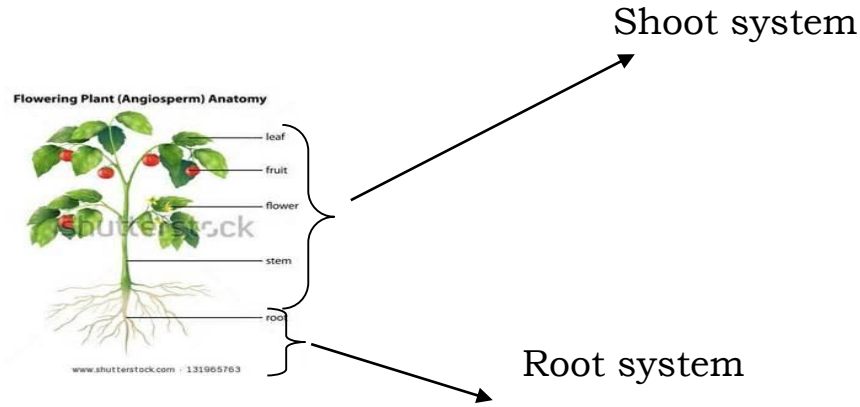
ROOT SYSTEM

This is the part of a plant that develops from the radicle

PARTS OF THE ROOT SYSTEM

- Tap root
- Root cap
- Lateral root
- Root hairs

PARTS OF A FLOWERING PLANT



Note:

- Flowering plants have both root system and shoot system

GROUPS OF FLOWERING PLANTS

- Monocotyledonous and
- Dicotyledonous.

Monocotyledonous plants (cereals):

- Monocotyledonous plants are plants that bear seeds with one cotyledon. They are also called **cereals.**
- They are rich in carbohydrates

Examples of monocotyledonous plants:

- Maize
- Millet
- Sorghum
- Rice
- Wheat
- barley

Characteristics of monocotyledonous plants.

- The seeds of monocotyledonous plants have only one cotyledon
- They have a fibrous root system.
- They have a parallel leaf venation

- Their seeds undergo hypogeal germination.

Dicotyledonous plants (legumes):

- These are plants that bear seeds with two cotyledons. They are also called **legumes.**
- They are rich in proteins

Examples of Dicotyledonous plants:

- Beans
- Ground nuts
- Soya beans
- Peas
- Bambara nuts

Characteristics of dicotyledonous plants.

- They have a tap root system.
- Their seeds have two cotyledons.
- Their seeds undergo epigeal germination
- They have network leaf venation.

Learner's activity

1. In one sentence state what you understand by the term classification of plants
2. Name the two groups of plants
3. Apart from root system, identify any other system of a flowering plant
4. Write one way under which roots are useful to;

a) People
b) Plants

5. Give two differences between cereals and legumes

ROOTS:

- The root system is the part that grows in the soil
- The root system involves main root, lateral roots, root hairs and the root cap.

Types of root systems.

- Tap root system
- Fibrous root system

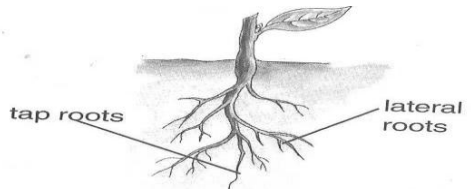
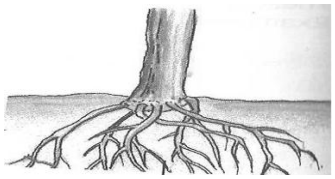
Tap root system

- Tap root grows directly from the radicle of the germinating embryo
- They are commonly found in dicots.

Fibrous root system

- Fibrous roots grow without a tap root or main root.
- They are commonly found in monocots.

Draw structures showing parts of a tap root and fibrous root systems.

Tap root system	Fibrous system
	

Function of roots to a plant

- Roots hold the plant (shoot system) firmly in the soil
- Root hairs absorb water and mineral salts from the soil
  NB: Mineral salts enter by a process called active transport.
- Some plants store their food in swollen roots.
- Prop roots provide extra-support to plants
- Breathing roots absorb oxygen especially in the mangroves.
- Root nodules of legumes store nitrogen-fixing bacteria that improves soil fertility.

Importance of roots to people:

- Swollen roots with stored food are sources of food to people e.g. Cassava, Sweet potatoes, & Carrots.
- Some plant roots acts as herbs to cure some diseases e.g. Mangoes, Blackjack, Moringa plant, etc.
- Big dry roots acts as source of wood fuel to people.
- Some big roots can be used in making craft items.

Learners Activity

1. How useful is a shoot system to a plant?
2. In the space below, draw the structure of a tap root system
3. Apart from making craft items, state one way in which roots are useful to people
4. In one sentence, show the meaning of a flowering plant.
5. Give two examples of flowering plants

TYPES OF ROOTS

- Tap roots
- Fibrous roots
- Adventitious root

Examples of adventitious roots include;

- Prop roots
- Breathing roots

- Buttress roots
- Clasping roots
- Stilt roots

Prop roots:

- ❖ Prop roots are common in cereal crops
- ❖ They mainly grow to provide extra-support to the plant especially at the flowering stage.

A structure showing the prop root system.

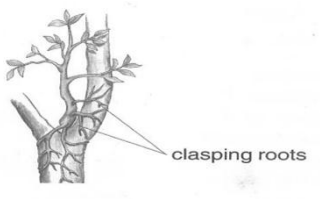
EXAMPLES OF PLANTS THAT DEVELOP PROP ROOTS

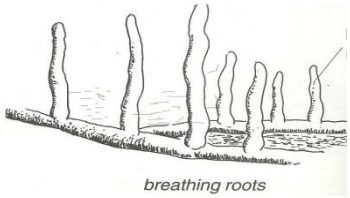
- Maize
- Sorghum
- Wheat
- Millet

Note:

- ❖ **Clasping roots** enable plants with weak stems climb other plants and rap sunlight energy.
- ❖ **Stilt roots** are found on plants which commonly grow in muddy or swampy areas. They are also known as breathing roots.
- ❖ They take in air for respiration of roots. This is because soil with a lot of water does not have enough air

A structure showing clasping roots& Breathing roots





Root tubers (storage roots):
These are swollen underground roots that store food for the plant.

Examples of root tubers:

- Cassava
- Carrots
- Sweet potatoes
- Beet roots
- Turnips
- Swede

Structure of root tubers:

Cassava	carrot	Sweet potato
		

Food stored by root tubers:

- Root tubers store starch. They are good source of carbohydrates.

Learners Activity:

1. In one sentence explain the following terms

a) Tap roots.
b) Fibrous roots

2. Give two examples of adventitious roots
3. Draw a structure of prop roots
4. State the importance of prop roots to a plant
5. When do plants like maize develop prop roots?
6. State one example of a storage root.

PLANT STEMS

- The stem is the biggest part of the shoot system of a plant.
- It holds leaves, flowers, fruits, branches and terminal bud.

Functions of stems to a plant

- They hold and space out leaves to receive the sunlight energy
- Stems transport water and mineral salts from the roots to the leaves
- Green stems help in the process of photosynthesis
- Stems conduct manufactured food in the leaves to all other parts of the plants.
- Stems hold flowers and fruits for easy pollination and dispersal
- Some plant stems have thorns for protection

Functions of stems to people.

- Some plant stems act as a source of food to both people and animals
- Big stems provide people with timer and poles for construction
- Plant stems act as a local medicine to cure some animal diseases

- Some plants are harvested to provide wood fuel to people
- Some plant stems are used for propagation i.e. cassava, sugarcanes and some flowers.

Types of stems

- Upright/erect e.g. mango, pawpaw, maize, beans. climbing, creeping
- Underground stems e.g. stem tubers, bulbs, corms, rhizomes.
- Weak stems i.e.

Climbing stems e.g. passion fruit, white yam, and oil nut.
Creeping stems e.g. Pumpkins, sweet potatoes, wondering Jew

Underground stems

- These are stems which grow from underground.

Examples of underground stems:

- Bulbs
- Rhizomes
- Corms
- Stem tubers

BULBS

EXAMPLES OF BULBS

- Onions
- Garlic
- Spider lily

DIAGRAM OF AN ONION

FUNCTIONS OF SOME PARTS

- **Fleshy leaves** store food
- **Scale leaves** protect fleshy leaves
- **Foliage leaves** make food
- **Axillary bud** grows into a new bulb

CLASSES OF FOOD PRESENT IN ONIONS

- Vitamins
- Mineral salts

RHIZOMES

Rhizomes always grow horizontally under the ground with stored food

EXAMPLES OF RHIZOMES

- Ginger
- Cana lily
- Coach grass
- Turmeric
- Spear grass
- Zoysia grass

DIAGRAM SHOWING A RHIZOME

CORMS

Corms grow vertically underground with stored food
The corms are rich in carbohydrates

EXAMPLES OF CORMS

- Coco yams
- Crocus
- Gladiolus

STRUCTURE OF A CORM

STEM TUBERS

Stem tubers are crops with underground stems which store food

Examples of stem tubers

- Irish potatoes
- White yams

Diagram of an Irish potato

WEAK STEMS

weak stems get support from upright stems

GROUPS OF WEAK STEMS

- Climbing stems
- Creeping stems

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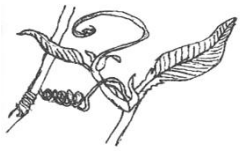
Climbing stems are weak stems of plants that cannot support themselves upright.
Plants climb others for support in order to get sun light energy.

How plants climb others

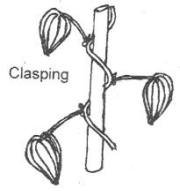
Plants with weak stems climb other by;

1. **Use of tendrils**



2. **Use of hooks**

3. Twining or clasping



<u>Reasons why plants with weak stems climb others</u>

1. For extra support to get enough sunlight
2. To expose their flowers for pollination

<u>Creeping stems</u> are stems that grow from the ground

Examples of plants with creeping stems

- Pumpkins
- Sweet potatoes
- Wandering Jew
- Vanilla
- Water melon

UPRIGHT STEMS/ERECT STEMS

These are stems that can support themselves upright.

EXAMPLES OF PLANTS WITH UPRIGHT STEMS

- Paw paws
- Mangoes
- Maize
- Beans

Learner's activity:

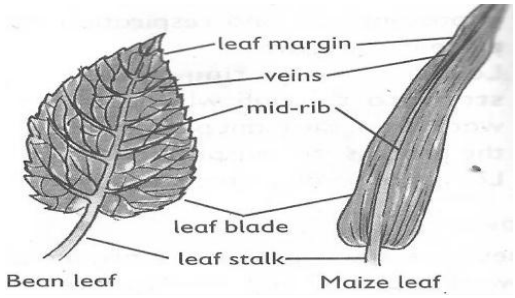
1. In one sentence explain why plants climb others.
2. Using a diagram, show how plants climb others by clasping
3. Explain the term stem tubers
4. Apart from ginger and zoysia grass, mention any one other example of a rhizome.
5. Write any two ways in which stems are useful to;
    a) Plants
    b) People

PLANT LEAVES

- Leaves are the green parts of a plant with stomata for gaseous exchange and transpiration.

- Leaves have chlorophyll to trap sunlight energy and manufacture its starch.
- Leaves also form the shoot system of a plant.
- A leaf is fixed between two internodes on a plant stem or branch.

A drawn structure showing a leaf.



Functions of the above parts.

Lamina

- It has a surface area for easy trapping of sunlight energy by the help of chlorophyll
- It's where the stomata are found.
- It helps in the manufacturing of starch

Stomata

- It's called stoma for singular and stomata for plural.
- They are small holes on the leaf where gaseous exchange takes place.
- They also open to allow water escape during the process of transpiration.
- The stomata also let in carbon dioxide by diffusion during day time and oxygen during night time.

Leaf veins.

- They supply water and nutrients within the leaf

Leaf apex.

- It's the sharp tip part of a leaf to provide protection to the leaf

Leaf stalk / petiole

- This provides attachment of the leaf to stem or a branch.

Note: there are mainly two processes that take place in plant leaves namely;

- Photosynthesis
- Transpiration

Learners Activity

1. Identify two important processes that take place in plant leaves.
2. Draw and name parts of a leaf
3. State the functions of the following parts of a leaf;

a) Veins
b) Chlorophyll
c) Petiole

4. How can plant leaves be useful to people?

TYPES OF LEAVES

Types of plant leaves

- Simple leaves
- Compound leaves

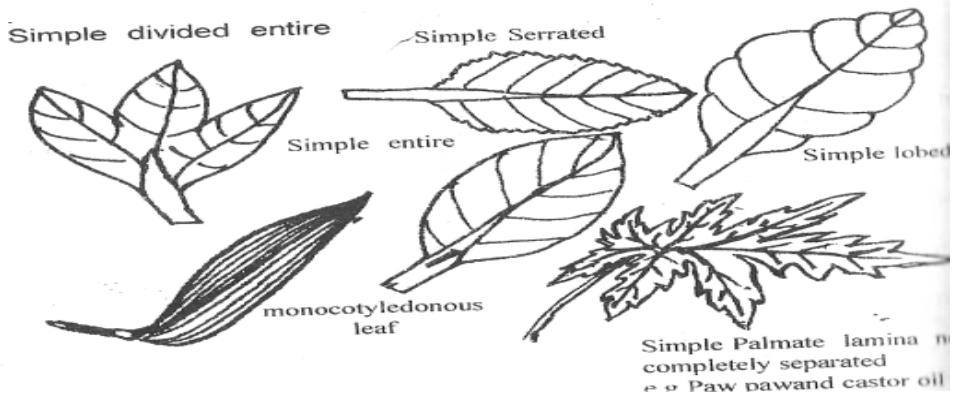
Simple leaves

- Simple leaves are leaves that have one leaflet on each leaf stalk.

Examples of simple leave include;

- **Simple serrated leaf** e.g. tick berry, black jack
- **Simple palmate leaf** e.g. pawpaw leaf, cassava leaf
- **Simple divided entire leaf** e.g. sweet potatoes
- **Simple lobed leaf** e.g. mango leaf, coco yam leaf
- **Simple entire leaf** e.g. orange leaf

Dawn structure showing different examples of simple leaves



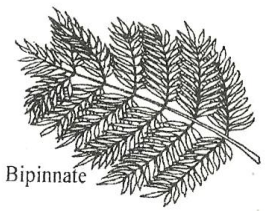
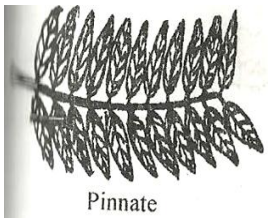
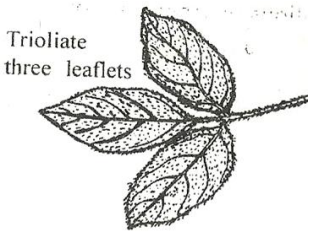
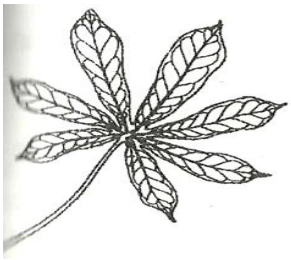
Compound leaves

- Compound leaves have more than one leaf-let on one leaf blade or stalk.
- Each leaflet has a small stalk which is attached to a common leaf stalk.

Examples of compound leaves;

- Compound trifoliate e.g. Beans leaves
- Compound bi pinnate e.g. Jacaranda leaves/ mimosa plant
- Compound digitate leaf e.g. Silk cotton leaves
- Compound pinnate e.g. acacia leaves /eucalyptus

Drawn structures showing examples of compound leaves

Bi Pinnate	Pinnate	Trifoliate	Digitate
			

Leaf venation

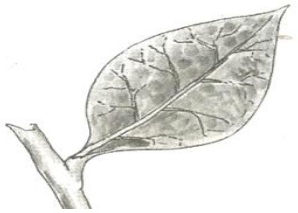
- Plant leaf venation refers to the arrangement of veins in a leaf.
- Veins in a plant leaf help in the distribution of water and mineral salts and translocation.

Types of leaf venations:

i) Network leaf venation
ii) Parallel leaf venation

Network leaf venation is a characteristic of dicotyledonous plants.

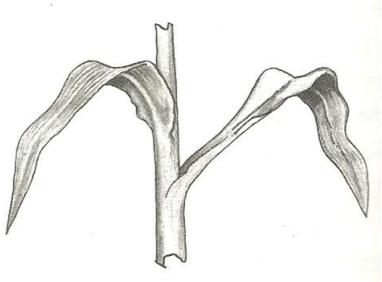
A drawn structure showing a network leaf venation of a plant leaf.



Note:

- Network leaf venation is common in both simple and compound leaves.
- Parallel leaf venation is a characteristic of monocotyledonous plants.

Drawn structure showing a leaf with parallel leaf venation.



Importance of leaves to people

- People eat leave as food.
- People use leaves as herbal medicine.
- Some leaves are used for thatching houses

- Palm leaves are used for making mats

Importance of leaves to plants:

- Leaves are used for photosynthesis.
- Some leaves store food for the plant.
- For transpiration.
- Some leaves are used for propagation e.g. bryophyllum
-

Learner's activity

1. Write one sentence to show the meaning of the following;
a) Venation
b) Parallel venation
2. Draw the structure of a simple lobed leaf
3. Give two examples of compound leaves

4. Which of the leaves **A** and **B** is a compound leaf?

A

B

PHOTOSYNTHESIS IN PLANTS

Photosynthesis in plants

- Photosynthesis is the process by which plants make their own food by the help of sunlight energy.
- The word "photo" means light, "synthesis" means to make or "buildup"

Raw materials needed

There are two raw materials needed during the process of photosynthesis.

Water

Carbon dioxide gas

- This is synthesized to make carbon
- Both water and carbon dioxide combine to build up glucose stored in the plant leaves as starch.

Conditions necessary for photosynthesis

- Chlorophyll – to trap the sunlight energy
- Sun light energy – provides energy needed to speed up the formation of the starch.

Note:

- ❖ Oxygen is a by-product of photosynthesis while starch is the main product.
- ❖ Photosynthesis is a chemical change in plants.

ADAPTATIONS OF LEAVES TO CARRY OUT PHOTOSYNTHESIS

- Leaves are arranged in a regular pattern in the stem
- Leaves have a thin membrane for carbon dioxide to diffuse easily
- Leaves contain chlorophyll to trap sun light
- Leaves have a broad and flat surface to absorb sun light easily

IMPORTANCE OF PHOTOSYNTHESIS TO PLANTS

- It helps plants to obtain food

IMPORTANCE OF PHOTOSYNTHESIS TO ANIMALS

- Animals get oxygen from the process of photosynthesis
- Animals get food from the process of photosynthesis

Note

Photosynthesis does not occur at night

Why?

Due to absence of sun light at night

AN EXPERIMENT TO TEST A LEAF FOR STARCH

Materials needed

- Leaves
- Beaker
- Iodine solution
- Source of heat
- Methylated spirit
- Water
- Plates

Steps/procedures

- ➢ Detach/remove the leaf from the plant and boil it in water
  Reason: to kill the cells and destroy enzymes in it
- ➢ Boil the leaf in methylated spirit
  Reason: to remove chlorophyll from it
- ➢ Wash the leaf with water
  Reason: to remove methylated spirit
- ➢ Dip the leaf in iodine solution

OBSERVATION

When the leaf changes to blue black or dark blue, starch is present and when starch is absent, the color remains brown.

Learner's activity.

1. Write one word to refer to the process by which plants make their own food
2. Write any one raw material for the process above
3. State one way in which the following can be useful during photosynthesis;

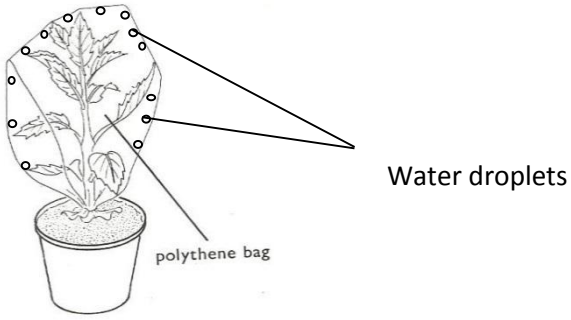
a) Sunlight
b) Water

4. Apart from oxygen, mention any other product of photosynthesis
5. Briefly explain why photosynthesis cannot take place at night.

LESSON4: TRANSPIRATION IN PLANTS

- Transpiration is the process by which plants lose water as vapour into the atmosphere
- Transpiration takes place in plants through the stomata of leaves, lenticels and in the cuticle of stems.

Illustration showing transpiration in plant leaves.



Factors that affect the rate of transpiration in plants;
Wind

- Wind blows off the water vapour on the plant leaf giving chance or space for more vapour to come out. This increases the rate of transpiration.

Humidity:

- Humidity is the amount of water vapour in the atmosphere.
- High rate of humidity lowers the rate of transpiration and vice versa.

Temperature:

- High temperature during hot days causes plant leaves to lose a lot of water than on cool days.

Sunlight:

- Heat from the sun causes the opening of the stomata, lenticels and cuticle hence creating more chances of losing water.

Surface area of the leaf:

- Plants with small surface area of their leaves lose water at a lower rate than those with larger leaf surface area.

Number of stomata:

The higher the number of stomata, the higher the rate of transpiration and vice versa

Types of transpiration:

- Stomatal transpiration
- Cuticular transpiration
- Lenticular transpiration

Note:

A) **In stomatal transpiration** plants lose water through stomata.
B) **In cuticular transpiration** plants lose water through the cuticle of stems.
C) **In lenticular transpiration** plants lose water through lenticels.

Importance of transpiration to the plants

- Transpiration helps water and mineral salts to move from roots to the rest of the plant parts by the process of capillary attraction.
- Transpiration helps in cooling the plant during a hot day.

Importance of transpiration to environment;

- It helps in the formation of rainfall.

Dangers of transpiration

- Excessive transpiration makes plants to dry (wilt)
- It lowers the crop yields due to less water left in the plant.

Ways plants reduce the rate of transpiration.

- Some plants reduce the rate of transpiration by shedding their leaves especially during dry season e.g. deciduous plants (Mvule, Oak & fig trees)

- Stems have tough cuticles and lenticels to guard against water loss.
- Some plants curl their leaves
- Some plant leaves have few stomata and distributed at the lower part of the leaf.
- Some plants have leaves with a small surface area to reduce the rate of water loss
- Leaves have a wax-like layer to cover their stomata to limit the water loss.

Learner's activity.

1. Briefly explain the term transpiration
2. Cite out any two factors that affect the process of transpiration
3. Give two ways in which transpiration can be useful to a plant
4. Explain any two ways in which transpiration can be a disadvantage to a plant.
5. Make an illustrative drawing to show that a plant shoot transpires

Buds:

- A small part on a plant that grows into flowers, branches and leaves

Types of buds

a) Terminal buds

- These are the main growing tips of a plant shoot.

b) Axillary buds

- These are buds which grow into branches and flowers.

Illustrations showing buds

Terminal bud	Axillary buds or lateral bud

Importance of buds to plants

- Buds develop into branches and flowers.

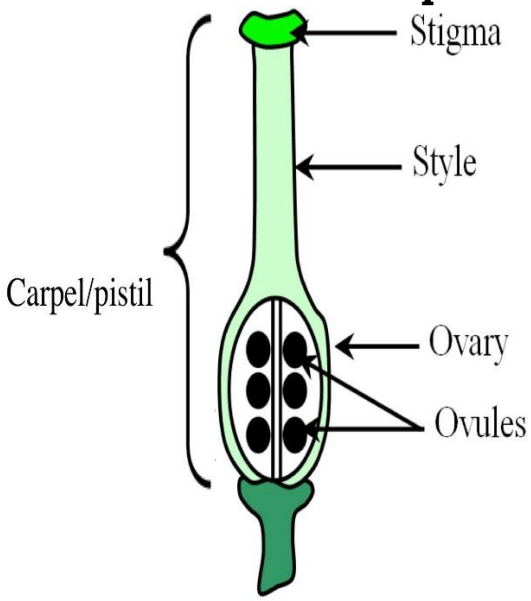
LESSON 5: FLOWERS

- The flower is the reproductive part of a flowering plant. Process of reproduction takes place.

Pistil (female part)

- It is the female part of a plant.
- Pistil is made up of stigma, style, ovary and ovules

Illustration of a pistil:



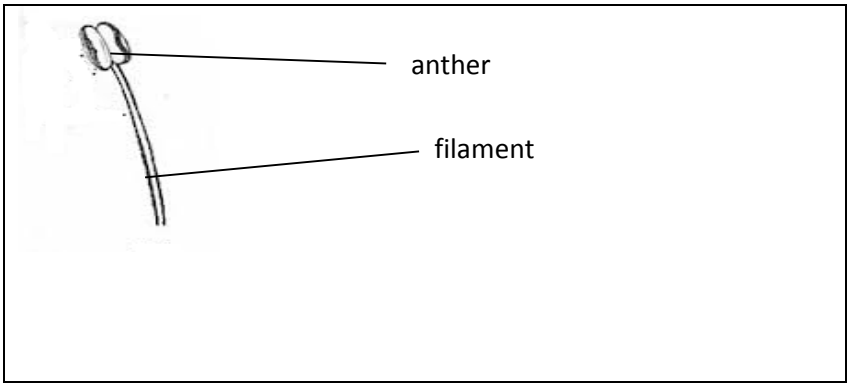
Stamen (male part)

- This id the male part of a plant.
- It is made up of the filament and anther head.

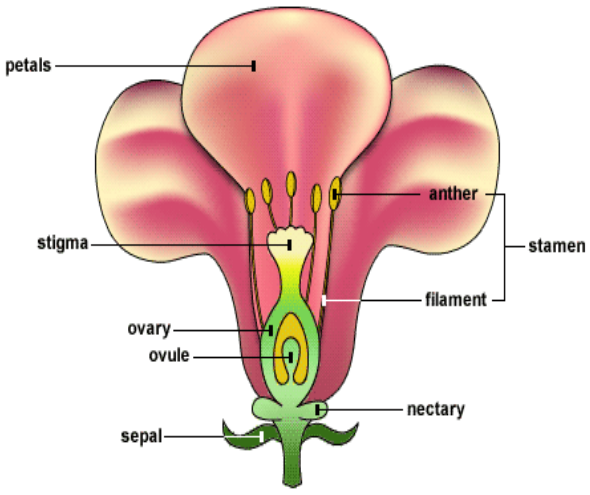
NB: The male reproductive cells are the pollen grains and female are the ovules.

Illustration of a stamen:

Stamen



Drawn structure showing parts of a flower.



Functions of the parts

Petals, the brightly coloured petals help to attract pollinating agents such as insects.

- A group of petals is called ***corolla***

Sepals- Green sepals help to manufacture food for the plant.

- Protect the inner parts of the flower at an early stage (bud stage)
- A group of sepals is called ***calyx***

Stigma. Its function is to receive pollen grains

- Pollen grains develop pollen tubes and grow down into the ovary

Style: is a passage of the pollen grains to the ovary.

- The style also supports / holds the stigma in position.

Ovary. It produces the female gametes called ovules.

- A fertilized ovary develops into a fruit.

Filament. Holds the anther in position.

Anthers. Produce and store pollen grains.

Importance of flowers to plants

- Flowers help plants to reproduce

Importance of flowers to people

- Some flowers are eaten
- Some flowers are used for decoration.
- Flowers are used to make perfume

Learner's activity.

1. What scientific name is given to a group of;
a) Petals
b) Sepals
2. Of what importance are brightly coloured petals to a plant
3. Give two uses of flowers to human beings
4. Draw and name parts of a female part of a flower

LESSON 6: POLLINATION

- Pollination is the transfer of pollen grains from the anther to the stigma of a flower on a plant.
- Pollination helps to allow fertilization in plants
- The pollen grains are the male gametes while the ovules are the female gametes in plants.

Types of pollination

There are two types of pollination namely;

- Self-pollination
- Cross pollination

Self-pollination:

- Self-pollination is the transfer of pollen grains from the anthers to the stigma of flowers on the same plant

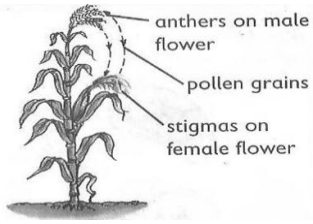
Characteristics of flower that undergo self-pollination:

- Flowers with self-pollination have shorter style compared to their filaments
- They also have brightly coloured petals to attract pollinators

ADAPTATIONS OF FLOWERS TO SELF POLLINATION

- Both the anther and stigma maturing at the same time.
- Their flowers remain closed until self-pollination takes place

Structure illustrating self-pollination.



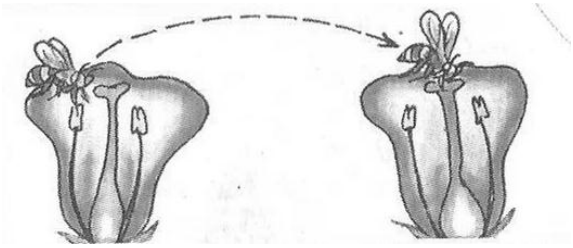
Cross pollination

- Cross-pollination is the transfer of pollen grains from the anther heads the stigma of a flower on another plant but of the same type or species.
- In cross–pollination, the filaments are shorter than the style.

Adaptation of some plant to cross pollination

- The anthers and stigma mature at different times e.g. maize plant.
- When pollen grains land of the stigma of the same flower they done develop pollen tubes
- The male and female parts of a flower grow on different plants or parts of a plant e.g. papaw plant

Illustration showing cross-pollination.



Agents of pollination:

- Agents of pollination refers to the factors that are responsible or cause pollination to take place.

These include; -

- Wind
- Insects

- Birds

Note:

- Insects that pollinate flowers include; bees, butter flies and moths which pollinate flowers at night by the help of scent.
- Birds that pollinate flowers include; sun bird and humming birds

Characteristics of insect-pollinated flowers

- They have scent.
- They have brightly coloured petals.
- They produce sticky pollen grains.
- They have sticky stigma.

Characteristics wind pollinated flowers

- They produce a lot of pollen grains,
- They have no scent,
- They have dull petals
- They don`t produce nectar.

Learner's activity.

1. Briefly explain the term pollination
2. Name the agents of pollination
3. Identify two factors that favour;

a) Self-pollination
b) Cross-pollination

4. Give any one difference between insects and wind pollinated flowers

SEEDS

- A seed is a fertilized ovule.
- A seed develops into a young plant or a seedling under favourable conditions.

Dicotyledonous seeds

❖ Dicotyledonous seeds are seeds with two cotyledons

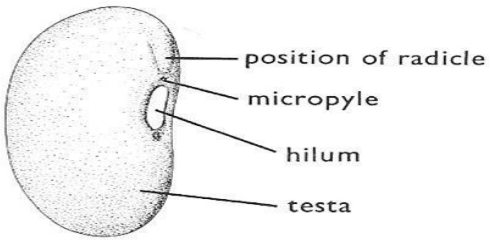
Examples include:

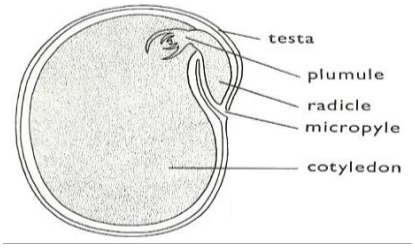
- Bean seeds
- Peas
- Groundnut seeds

NB: All dicotyledonous seeds undergo epigeal germination.

A drawn structure showing parts of external and internal parts of a bean seed.

External Parts	Internal parts





Monocotyledonous seeds:

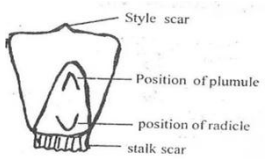
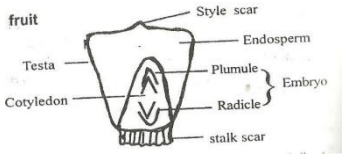
- Monocotyledonous seeds are seeds with only one cotyledon.

Examples include;

- Maize,
- Millet,
- Sorghum, etc.

NB: Monocotyledonous seeds undergo hypogeal germination.

Drawn structures showing external and internal parts of a maize grain.

External parts	Internal parts
	

Functions of the above parts.

Seed coat (Testa)

- It protects the inner delicate parts of the seed.

Cotyledon

- Absorbs stored food from the endosperm to the embryo during germination.

Endosperm

- Stores food in monocotyledonous seeds.

Plumule

- It grows into shoot system

Radicle

- Grows into the root system.

Micropyle

- It's a passage of air and water to the seed embryo.

Importance of seeds to plants:

- Seeds help plants to multiply in number.

Importance of seeds to people

- Seeds are eaten as food.
- People sell seeds and get money.
- Some are used to produce artistic work.

Learner's activity.

1. Why a maize grain is called a fruit?
2. Use two ways in which seeds are useful to people
3. Draw and name the following parts of a bean seed.

i. Micropyle
ii. Hilum / scar

iii. Testa

4. State the functions of the following parts of a maize grain.

i. Endosperm

ii. Cotyledon

iii. Stalk scar

5. Write any one difference between monocotyledonous and dicotyledonous seeds

GERMINATION IN PLANTS

- Germination is the development of a seed embryo into a seedling.

Note:

- During germination, the Radicle grows into the root system to support the seedling firmly into the soil.
- The radicle also grows root hairs to absorb water and mineral salts from soil.

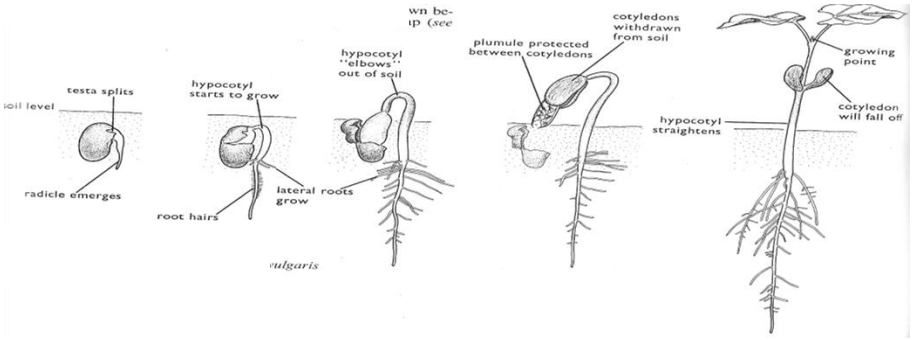
Types of germination

- Epigeal germination
- Hypogeal germination

Epigeal germination:

- Epigeal germination is a type of germination where the cotyledon comes out of the ground.
- Epigeal germination is a common characteristic of dicotyledonous seeds e.g. Beans, soya beans, groundnuts.

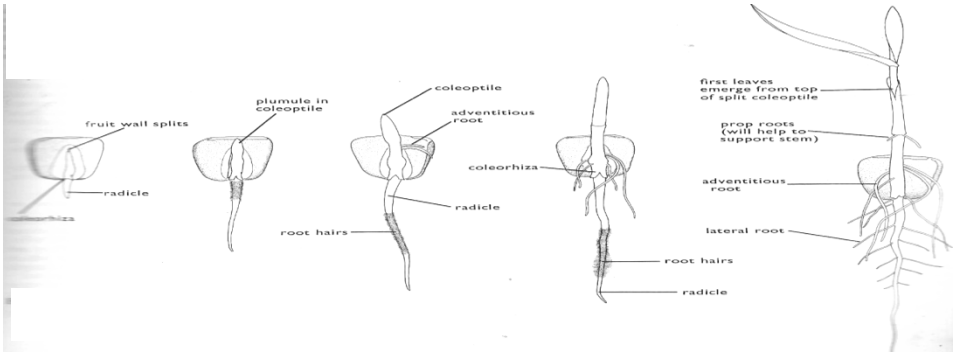
Drawn structure showing the different stages in Epigeal germination.



Hypogeal germination:

- This is a type of germination in which the cotyledon remains under the ground
- This type of germination is a common characteristic of monocotyledonous seeds e.g. maize, millet, rice, sorghum

Stages involved in Hypogeal germination.



Conditions necessary for seed germination.

- **Oxygen** for respiration by the seed embryo
- **Water** for softening the Testa
  Dissolves food stored in the cotyledon
- **Warmth**. Activates enzymes in the seed(zymase enzyme)

Seed viability:

- Seed viability is the ability of a seed to germinate under favourable conditions.
  Viable seeds are seeds that are able to germinate when given necessary conditions.

A viable seed should be;

- Mature and dry
- Whole without a hole / wrinkles
- Healthy and of a good variety

  SEED DORMANCY

  Seed dormancy is the inability of a seed to germinate when given favourable conditions.

A dormant seed is a seed which is unable to germinate under favourable conditions.

Experiments for conditions needed for germination.

Learner's activity.

1. State what you understand by germination of seeds
2. Point out any two conditions necessary for seed germination.
3. Using diagrams, show the different stages of a germinating bean seed
4. List any two characteristics of a viable seed
5. If a seed is not viable, it's said to be dormant. What does seed dormancy mean?

Tropism:

- Tropism is the plants growth movement in response to stimulus (change in the environment)

Stimulus:

This means changes in the environment.

Phototropism:

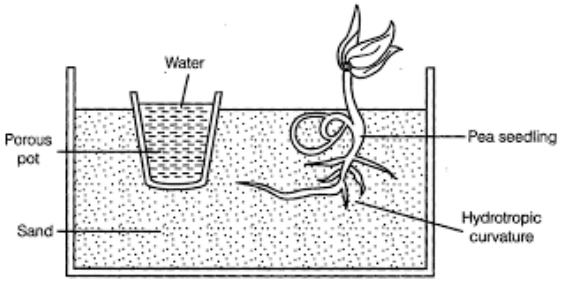
- This is the plant's growth movement towards the source of light.

Illustration:

Hydrotropism

- This is the plant's growth movement towards the source of water.

Illustration:



Geotropism:

- This is the plant's growth movement towards the direction of gravity force.

Thigmotropism/ hyptotropism

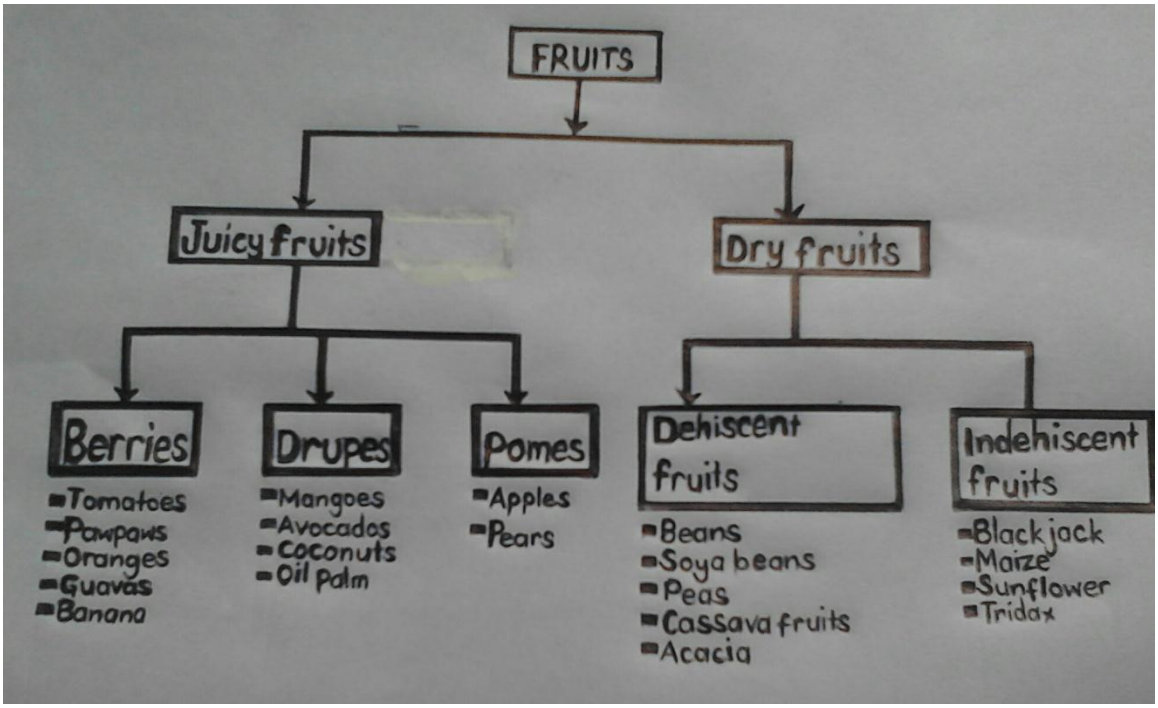
- This is the plant's growth movement in response to the direction of touch.

Chemotropism

This is the plant's growth movement towards the source of chemical.

FRUITS

- A fruit is a developed ovary.
- A seed is a developed fertilized ovule.
- A fruit is any structure in flowering plants that contains seeds
- A fruit has two scars i.e. style scar and stalk scar.



Fruits are divided into two;

- Succulent fruits (Juicy fruits)
- Dry fruits (Non juicy fruit)

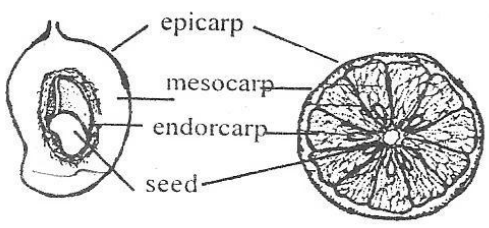
a) Succulent fruits

- Succulent fruits are groups of fruits with juicy pericarps and are eaten.

These include berries, pomes and drupes

- ***Berries*** are succulent fruits with many seeds like guavas, tomatoes, oranges etc.
- ***Drupes*** are succulent fruits with only one seed such as avocado fruit and mango fruit.
- ***Pomes*** are succulent that develop from the receptacle e.g. apples and pears

Drawn structure showing the different parts of a juicy fruit (mango and orange)



b) **Dry fruits**

These are fruits whose pericarp is usually dry hard and woody.

They are divided into two namely;

- Splitting (dehiscent fruits)
- Non-splitting (indehiscent fruits)

Splitting (dehiscent fruits)

- *Splitting fruits* have capsule or pods that split to disperse their seeds when dry. E.g. Beans, peas and castor oil.

Non-splitting (indehiscent fruits)

- *Non-splitting fruits* have one seed only.
- Their pericarp does not split to disperse the seeds but have structures for their mode of dispersal. E.g. Black jack, maize, sunflower, tridax etc.

Note:

- Some fruits develop from one flower. They are called *simple fruits*.
- Sometimes all flowers on a stalk make one fruit. Such fruits are called *compound* or *multiple fruits e.g.* Pineapple.
- Some fruits are not formed from the ovary of a flower but from some other parts of a flower. Such fruits are called *false fruits*. E.g. an apple which develops from a receptacle

Learner's activity.

1. Briefly explain the following terms;

a) A fruit
b) Dehiscent fruits
c) Multiple fruits

2. Cite out one example of a false fruit
3. Write one way in which black jack is different from castor oil.
4. List two functions of fruits to plants
5. Give two examples of juicy fruits

SEED AND FRUIT DISPERSAL

- Dispersal is the scattering of seeds / fruit from the parent plant to other areas.
- In some plants only seeds are dispersed while other plants it's the fruits.

Agents of seed and fruit dispersal

- Animals
- Wind
- Flowing water
- Self-dispersal or explosive mechanism

Importance/advantages of seed and fruit dispersal

- Dispersal enables plants to colonize new areas
- Dispersal reduces competition for light and the nutrients among plants.
- Dispersal increases the chances of the plant survival.

Types or mechanisms of seed dispersal are;

- Wind dispersal
- Animal dispersal
- Water dispersal
- Explosive mechanism.

Characteristics of seeds dispersed by animals

- They have juicy mesocarps
- Some have hook-like structures to attach them on the animals' bodies
- Some have hard seed coats to protect them from the digestive juices.

Examples of seeds dispersed by animals are;

- Mango fruit
- Guava fruit
- Jack fruits
- Avocado fruit
- Black jack etc.

Characteristics of seeds dispersed by wind

- Many are small and light to be easily carried by wind.
- Some like jacaranda seeds have wing-like structures for floating in air.
- Some like a dandelion have a parachute hair structure

- Some have a tuft of hair e.g. cotton seeds

Note:

- Seeds dispersed by ***explosive mechanisms*** split their pods when ripe and disperse their seeds.
- These include; castor oil, peas and beans.

Characteristics of Seeds dispersed by *flowing water*

- These seeds have numerous air spaces with an air tight covering
  Examples of Seeds dispersed by *flowing water*
  Water lilies and coconut fruits.

Learner's activity.

1. Write one word to mean the scattering of seeds from one mother plant to other areas
2. Write any two methods of seed dispersal
3. Give two ways in which seed dispersal can be useful to plants
4. List two differences between wind and animal dispersed seeds
5. Draw the structure of a tridax

Plant propagation

Plant propagation the process by which plants grow into new ones

Types of plant propagation

1. Seed propagation
2. Vegetative propagation

Seed propagation

This is the obtaining of new plants from seeds

Examples of plants propagated by seeds

i. Carrots
ii. cabbages
iii. tomatoes
iv. passion fruits
v. beans
vi. maize

Note: All flowering plants and conifers can be propagated by means of seeds

Vegetative propagation

This is the obtaining of new plants from other parts of a plant other than seeds

Types of vegetative propagation

1. Natural vegetative propagation
2. Natural vegetative propagation

Natural vegetative propagation

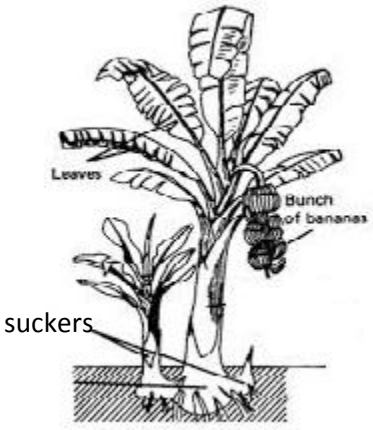
This is when an axillary bud of a plant grows into a lateral shoot and develops its own roots.

Examples of natural vegetative propagation methods

Method	**Examples**
Use of suckers	Bananas, pineapples, sisal,

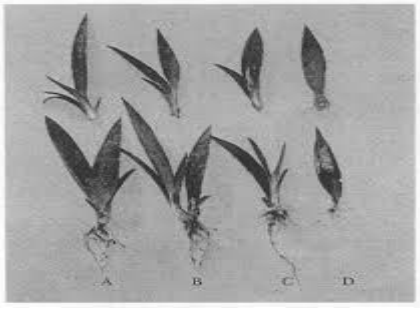
Use of stem tubers	Irish potatoes, white yams
Use of bulbs	Onions, garlic
Use of rhizomes	ginger, coach grass, spear grass
Use of corms	Cocoyams, crocus, gladiolus
Use of leaves	Bryophyllum
Use of potato vines	Sweet potatoes

Suckers



banana

Sisal suckers

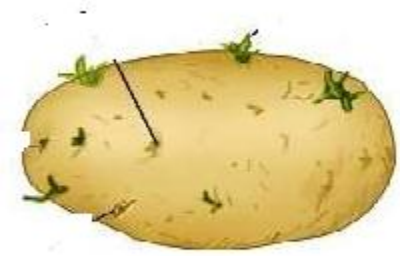


Growing sisal

Note: sisal is mainly propagated by means of sisal bulbils

Sisal bulbils

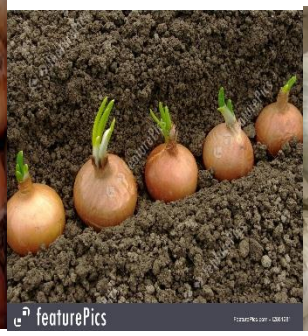
Stem tubers



An Irish potato

White yams

Bulbs



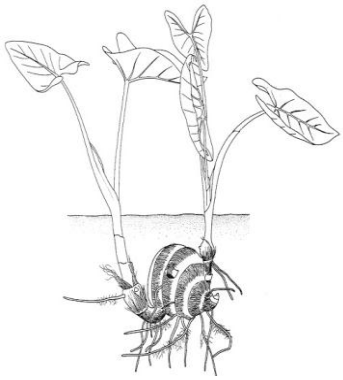
Onions

Garlic

Rhizomes

Ginger

Corms



Coco yam

Germinating bryophyllum

Sweet potato vines

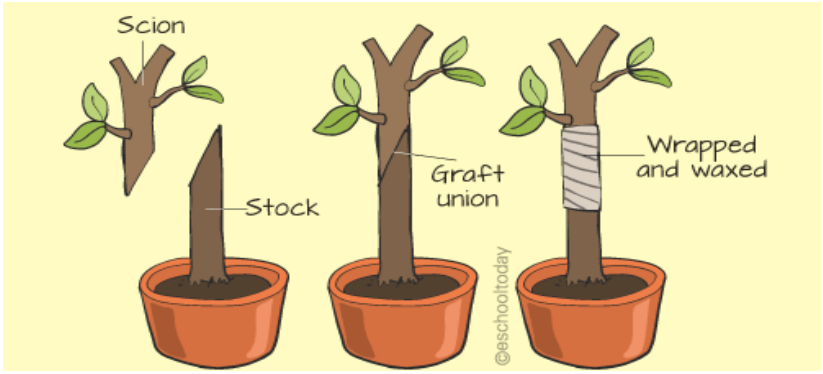
Artificial vegetative propagation

This is a type of plant reproduction that involves human intervention

Examples of artificial vegetative propagation methods

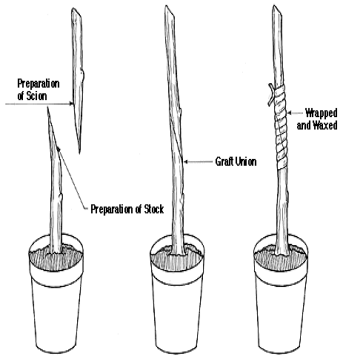
1. **Grafting**

   This involves use of a branch of a plant called scion and the stem of another plant called stock. When the scion is tied into the cut stock, it grows into a new plant



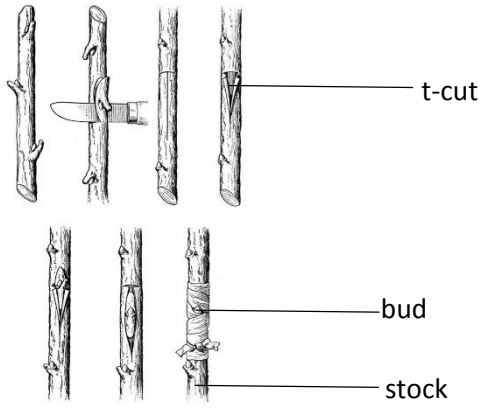
scion

stock



2. **Budding**

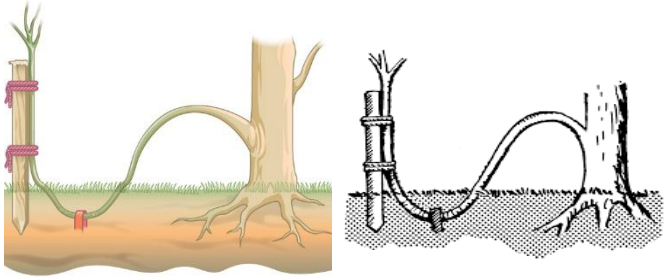
This involves use of a bud of one plant and the stem of another plant called stock. When the bud is tied into the cut in the stock, it grows into a new plant.



Note: budding and grafting are often done with fruit trees oranges, mangoes, lemons, etc.

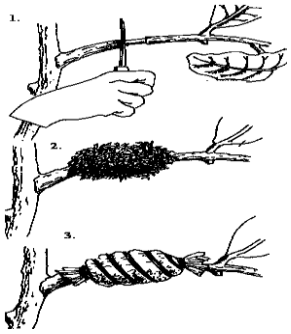
3. **Layering**

   This involves pegging down a plant branch so that it touches the soil. A cut is made in the bark where the branch touches the soil. Through that cut, new shoots develop and the new bud grows into the air.

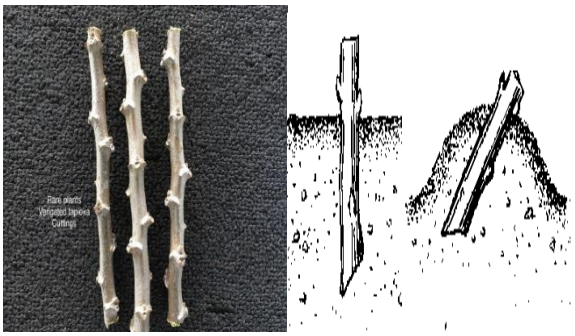


4. **Marcotting**

   This involves cutting a ring through the bark of a branch. After the ring is cut, rich soil is applied around it until new roots develop. When the roots are established in the soil, the branch is detached from the mother plant and planted in the garden



5. **Use stem cuttings** e.g. cassava, sugar canes, clonal coffee, etc.



Advantages of vegetative propagation

1. Plants mature fast
2. Helps to improve quality of plants
3. Helps to obtain new plants from plants which do not reproduce sexually e.g. bananas and pineapples
4. Only one parent plant is involved
5. The new plant use food of its parent plant when still developing

Disadvantages of vegetative propagation

1. It may lead to maintenance of undesired qualities of plants
2. Diseases of parent plants can be passed on to new plants
3. Vegetative propagation can result into crowding of plants